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(54) Title: SYSTEM AND METHOD FOR MANIPULATION OF CONTENT FOR DISPLAY ON DEVICES WITH SMALL DISPLAY AREAS

(57) Abstract: A system and method for manipulating content such as a website by analyzing, extracting, re-scaling, and/or reconfiguring for display on devices with small display areas are disclosed. The reconfiguration system reconfigures a source content for display on a client display, typically a small display. The system generally comprises a filter adapted to examine the source content and filter the source content into one or more components and a reconfiguration application in communication with the filter and the client display, the reconfiguration application is adapted to analyze each of the components of the source content and to reconfigure the source content by generating a table of contents or reorganizing the components.

## **SYSTEM AND METHOD FOR MANIPULATION OF CONTENT FOR DISPLAY ON DEVICES WITH SMALL DISPLAY AREAS**

### **CROSS REFERENCE TO RELATED APPLICATIONS**

5 This application claims priority to U.S. Provisional Patent Application No. 60/179,721 entitled "Universal Document Display System" and filed on February 2, 2000, the entirety of which is incorporated by reference herein.

### **BACKGROUND OF THE INVENTION**

10 1. **Field of the Invention**

The present invention generally relates to a system and method for the manipulation of content for display on devices with small display areas. More specifically, a system and method for the manipulation of content such as a website by extracting, re-scaling, and/or reconfiguring data from the content for display on devices such as those with small display areas are disclosed.

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2. **Description of Related Art**

With the explosive growth of the Internet and Internet users, wireless Internet access is also rapidly growing at the same time as an increasing number of users gain wireless Internet access. Wireless access is typically obtained through the end users' handheld or mobile devices such as cellular telephones, personal digital assistants (PDAs), pagers, handheld personal computers (PCs), and various other devices.

Such handheld devices typically have smaller display areas when compared to those of traditional desktop personal computer screen displays. However, typical Web protocols and data formats such as HTML (HyperText Markup Language) are more suited for devices or systems such as desktop personal computers with relatively large display areas.

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Some methods have been developed to attempt to overcome the gap between existing Web content and services for mobile devices. For example, WAP (Wireless Application Protocol) is a standard that provides cellular telephones, pagers, and various other handheld devices with access to electronic mail as well as text-based Web pages. WAP provides a complete environment for wireless applications that includes a wireless counterpart of TCP/IP.

5 WAP features the Wireless Markup Language (WML), a streamlined version of HTML for small screen displays that was derived from HDML (Handheld Device Markup Language). HDML is a specialized version of HTML designed to enable handheld devices to obtain information from Web pages, developed prior to the standardization of the WAP specification.

10 WAP can operate independent of the air interface, e.g., GSM (Global System for Mobile Communications), TDMA (Time Division Multiple Access), CDMA (Code Division Multiple Access), CDPD (Cellular Digital Packet Data), iDEN (Integrated Digital Enhanced Network), PDC (Personal Digital Communications), etc., and independent of the device on which it operates.

15 WAP operates with the use of a WAP Gateway/Application Server. For example, Phone.com provides an UP.Link Server product that hosts WAP applications. The WAP Gateway interfaces between the Web server and a microbrowser in the mobile device by encoding and decoding WAP pages between the Web server and the microbrowser.

As another example, i-Mode, a proprietary system, is an information service that attempts to provide Web browsing, e-mail, calendar, chat, games and customized news on mobile phones. i-Mode uses a subset of HTML in contrast to the global WAP standard which uses WML. In particular, i-Mode is a packet-based information service from NTT DoCoMo (Japan). i-Mode was first introduced in 1999 and was one of the first smart phone systems for Web browsing.

25 Palm, Inc. provides wireless Web information access through a Web clipping application. The Web clipping application was developed for some of the most popular sites on

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the Web. The Web clipping application works by extracting or “clipping” specific information from the website and transmitting the information to the Palm handheld device via the wireless ISP. However, the Web clipping application specifically does not attempt to provide a Web-like experience. Rather, the Web clipping application attempts to provide particular information and 5 only from specific websites. As such, the Web clipping solution for handheld devices does not provide all the information available on a given website and does not provide the end user with a Web-link experience nor the freedom to surf any desired website on the Internet.

ProxiNet, as another example, provides proxy servers that interface between the Web servers and a proprietary client web application that runs on devices with the PalmOS operating 10 system. The proxy servers are situated and enable communication between other Web servers via the Internet on the one hand and the proprietary client application on a handheld device via the wireless Internet Service Provider (ISP) on the other hand. The proxy servers thus act as an intermediary between the handheld device and Internet Web servers.

The proxy servers serve up HTML content from other Web servers, decompose the 15 content into different components, transform each component using device-specific techniques, and deliver the reformatted device-specific content. The proprietary client web application is a small graphical presentation program that renders Web content transformed by the proxy servers.

In contrast to the solution promulgated by Palm, Inc., ProxiNet’s proxy servers attempt 20 to employ the look and feel of graphical Web browsers using similar terminology and actions. When an end user connects the client device to the Internet via a wireless modem, the proxy servers attempt to provide a Web-like experience and to give the mobile device end user Web access.

However, with the Web pages layout being designed for the conventional, larger desktop 25 display, much of the Web pages currently available over the Internet are not configured for optimal display and viewing on devices with small display areas. For example, a Web page may

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contain information or display on the left, right, top and/or bottom borders of the Web page, such as with the use of frames, in addition to the key information contained in a main or central portion of the particular Web page. Because the conventional desktop display is sufficiently large, all or most of the borders and the centrally located main content can be viewed in a single 5 Web browser window without the need for the user to scroll down or to the right.

For example, the information contained across the top border of the Web page may contain a main table of contents and/or banner advertisements. In addition, a more detailed table of contents for the particular portion of the Web content currently being displayed in the central portion of the Web page may be displayed along the left border. The bottom border of the Web 10 page may contain various links to miscellaneous information such as privacy statement, copyright, disclaimer, contact information, and/or a site map for the website. As is evident, any other combinations of border display, if any, may be implemented.

With conventional solutions that attempt to provide a Web-like experience to the end user via a handheld device, an initial viewable portion displayed on the smaller display area of the handheld device may only contain a top left portion such as the main table of contents of a conventional Web page designed for desktop display and viewing. Even when the user clicks a link to access a different Web page, the portion of the display that is viewable in the display area may still contain the same specific portion such as the main table of contents of the conventional Web page. The end user must scroll down and/or to the right in order to view the portion of the 15 display content that is different from the previous page. Thus, even with the above-described mobile or small display solutions, the end user is unable to have a Web-like experience using a 20 mobile computing device.

Thus, what is needed is a system and method for analyzing, transforming, and reconfiguring Web content for display such as on devices with small display areas. The system 25 and method may additionally transmit and deliver such reconfigured content to the device. It is also desirable to provide such reconfiguration of the content in a quick and efficient manner.

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Preferably, the Web content reconfiguring system and method employ the look and feel of graphical Web browsers to provide a Web-like Web surfing experience.

## SUMMARY OF THE INVENTION

5 A system and method for manipulating content such as a website by analyzing, extracting, re-scaling, and/or reconfiguring for display on devices such as those with small display areas are disclosed. Although such system and method are best utilized in devices with small display areas, it is to be understood that such system and method may be implemented in any suitable device and/or display configuration. For example, the system and method may be  
10 utilized in a conventional desktop personal computer display when multiple Web pages are simultaneously displayed, such as in multiple browser windows. It should be appreciated that the present invention can be implemented in numerous ways, including as a process, an apparatus, a system, a device, a method, or a computer readable medium such as a computer readable storage medium or a computer network wherein program instructions are sent over  
15 optical or electronic communication lines. Several inventive embodiments of the present invention are described below.

The reconfiguration system reconfigures a source content for display on a client display, typically a small display. The system generally comprises a filter and a reconfiguration application. The filter is adapted to examine the source content and to filter the source content  
20 into one or more components and the reconfiguration application is in communication with the filter and the client display and is adapted to analyze each component of the source content and to reconfigure the source content by generating a table of contents or reorganizing the components.

The reconfiguration application may reorganize the components by redistributing the  
25 components of the source content. For example, the redistribution may be dependent upon each component and the size and/or type of each component. The system may further include a

receiver and a transmitter in communication with the reconfiguration application. The receiver is adapted to receive input signals from the client device wherein the input signals identify the source content. The transmitter is adapted to selectively transmit signals to the client display device.

5       The filter may classify each component as an advertisement, banner, table of contents, frame, form, table, or simple text type. The reconfiguration application may be adapted to reconfigure a banner component according to a display size of the banner, an advertisement component according to a display size of the advertisement component and the number of advertisements in the advertisement component, and a frame or form component according to an established logical sequence of elements of the frame or form component and selectively generating a table of contents from the elements of the frame or form component.

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The reconfiguration application may also be adapted to reconfigure a table component by classifying the table as a non-table text formatted as a table or a table with table content. For example, where the table component is a non-table text formatted as a table, the reconfiguration application may reconfigure by extracting information from the table component and selectively generating a table of contents therefrom. Alternatively, where the table component is a table with table content, the reconfiguration application may reconfigure the table component by selectively rescaling rows with row headings and/or columns with column headings.

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A method for reconfiguring a source content for display on a client display is also disclosed. The method generally comprises receiving a source content from a source, reconfiguring the source content to a reconfigured content for display, and transmitting the reconfigured content to the client display for display on the client display. The reconfiguring generally includes filtering the source content into one or more components, analyzing each component of the source content, and generating a table of contents or reorganizing the components.

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A computer program product that reconfigures a source content for display on a client display is also disclosed. The computer program product generally comprises computer code that receives a source content from a source, computer code that reconfigures the source content to a reconfigured content for display, computer code that transmits the reconfigured content to the client display for display on the client display, and a computer readable medium that stores the computer codes. The computer code that reconfigures generally includes computer code that filters the source content into one or more components, computer code that analyzes each components of the source content, and computer code that selectively performs one of generating a table of contents and reorganizing the components.

These and other features and advantages of the present invention will be presented in more detail in the following detailed description and the accompanying figures which illustrate by way of example the principles of the invention.

### BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will be readily understood by the following detailed description in conjunction with the accompanying drawings, wherein like reference numerals designate like structural elements, and in which:

**FIG. 1** is a block diagram illustrating an overview of the communications among a source document or Web content, a device such as a handheld device, and a system for analyzing, transforming, and reconfiguring Web content for display such as on devices with small display areas;

**FIG. 2** is a block diagram illustrating exemplary components of a web page configured for display on a typical personal computer display;

**FIG. 3** is a flow chart illustrating a communication process between the client small display device and the reconfiguration application;

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**FIG. 4** is a flow chart illustrating a process for analyzing, transforming, and reconfiguring Web content for display on devices with small display areas;

**FIG. 5** is a flow chart illustrating in more detail the reconfiguration process for a banner or an advertisement;

5       **FIG. 6** is a flow chart illustrating in more detail the reconfiguration process for a table;

**FIG. 7** is a flow chart illustrating in more detail the reconfiguration process for a frame or a form;

**FIG. 8** is an illustrative display of a web page displayed on a typical personal computer display;

10      **FIG. 9** is an illustrative display of a selection page displayed on a device such as a small display device from which the end user may select the desired website and a display option;

**FIGS. 10-12** are illustrative displays of various components of the web page of **FIG. 8** reconfigured with the PDA summary display option for display on a exemplary PDA small display device;

15      **FIG. 13** is an illustrative display of another web page displayed on a typical personal computer display;

**FIGS. 14 and 15** are illustrative displays of various components of the web page of **FIG. 13** reconfigured with the text only display option for display on a exemplary PDA small display device;

20      **FIG. 16** illustrates an example of a computer system that can be utilized with the various embodiments of method and processing described herein; and

**FIG. 17** illustrates a system block diagram of the computer system of **FIG. 16**.

## DESCRIPTION OF SPECIFIC EMBODIMENTS

25      A system and method for the manipulation of content such as a website by analyzing, extracting, re-scaling, and/or reconfiguring the content for display such as on devices with small

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display areas are disclosed. The following description is presented to enable any person skilled in the art to make and use the invention. Descriptions of specific embodiments and applications are provided only as examples and various modifications will be readily apparent to those skilled in the art. The general principles defined herein may be applied to other embodiments and applications without departing from the spirit and scope of the invention. Thus, the present invention is to be accorded the widest scope encompassing numerous alternatives, modifications and equivalents consistent with the principles and features disclosed herein. For purpose of clarity, details relating to technical material that is known in the technical fields related to the invention have not been described in detail so as not to unnecessarily obscure the present invention.

10 invention.

**FIG. 1** is an overview illustrating the overall system 100 and communications among the components of the system, namely, a source document or Web content 104, a device with small display area 110, and a system or application 102 for analyzing, transforming, and reconfiguring or otherwise manipulating Web content for display on devices such as devices with small display areas via a network such as the Internet 108.

15 As shown, the source document or Web content 104 typically resides on or is stored in a web server 106. Although shown as a separate web server component, the web server 106 may be an actual web server, a proxy server, a cache, or any other suitable form of storing the source content document 104 and of allowing access to the stored source content document 104 via the Internet 108. The web server 106 is in communication with the Internet 108 such that client 20 applications such as web browsers on devices such as personal computers or any web-enabled devices may gain access to the source document or content 104. The reconfiguration application 102 to generate reconfigured content or document from the source content 104 is in communication with the web server 106 that contains the web content 104 via the Internet 108. 25 Thus, the manipulation or reconfiguration application 102 preferably retrieves the source document 104 from the web server 106 via the Internet 108.

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The reconfiguration application 102 is also in communication with the device having a small display area 110. Although the system and method are described herein as utilized by a device with small display areas, it is to be understood that the system and method may be implemented in any suitable device and/or display configuration. For example, the system and 5 method may be utilized in a conventional desktop personal computer display when multiple Web pages are simultaneously displayed, such as in multiple browser windows.

Although not shown, the reconfiguration application 102 may optionally be in communication with the small display device 110 via a wireless ISP or any other suitable intermediary entity, for example. The reconfiguration application 102 may receive requests 10 and/or any other form of data from the small display device 110 destined for the Web server 106. For example, the small display device 110 may transmit a URL request to the reconfiguration application 102. The URL request may correspond to the web server or host 106 and the particular web page or source document 104 requested. The reconfiguration application 102 then retrieves the requested document 104 from the web server 106 using the 15 URL specified. As another example, the small display device 110 may transmit data, such as data appended to the URL for a server-side CGI (Common Gateway Interface) program, or any other suitable forms of data.

The reconfiguration application 102 may also transmit responses to the small display device 110 for display. For example, in response to a request and/or data received from the 20 small display device 110, the reconfiguration application 102 may forward the request and/or data to the destination web server 106, receive response from the web server 106 in the form of web content, reconfigure or otherwise manipulate the content, and transmit the reconfigured document to the small display device 110. It is noted that the reconfiguration application 102 may also reconfigure any request and/or data from the small display device 110 prior to 25 forwarding the request and/or data to the destination web server 106.

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It is to be understood that the reconfiguration application 102 or algorithm for implementing the reconfiguration application 102 may reside in any suitable location or form. For example, the reconfiguration application 102 may reside on a server remote to the small display device 110. The remote server may be either separate from or collocated with the servers of a wireless ISP. In one example, the reconfiguration application 102 may reside and operate with a proxy server that facilitates communication between the target web server via the Internet and the small display device 100. Alternatively, the reconfiguration application 102 may be implemented by the small display device 110. For example, the reconfiguration application 102 may be implemented as a separate application, such as a plug-in for an existing browser, that can be executed in conjunction with a browser. As another example, the reconfiguration application 102 may be implemented as an algorithm in a web-intelligent web browser for the small display device 110.

When a proxy server is utilized, communication from the small display device is typically redirected to the proxy server rather than the specified target webpage. For example, if the end user specifies a destination URL such as www.yahoo.com, the small display device does not directly communicate with the host server of the specified destination URL. Rather, communication is between the small display device and the proxy server that in turn communicates with the specified destination URL.

The reconfiguration application 102 preferably can be executed independent of the operating systems utilized by the small display device 110. For example, the reconfiguration application 102 may be executed on a small display device 110 that utilizes the Palm, WinCE, Symbian, RIM (Research in Motion), or any other suitable operating system. The reconfiguration application 102 is also preferably device-independent such that the reconfiguration application 102 can be utilized regardless of the particular small display device 110. In addition, the small display device 110 is preferably compatible with and can handle HTML 3.x.

In addition, the reconfiguration application 102 preferably is independent of the carrier signal of the small display device and independent of the device on which it operates. Examples of types of carrier signals or air interfaces include GSM, TDMA, CDMA, CDPD, iDEN, PDC, Sprint PCS, packet switch, broadband wireless, G3, any wireless or LAN connection, etc. The 5 reconfiguration application 102 is also preferably compatible with WAP.

FIG. 2 is a block diagram illustrating exemplary components of a web page 120 configured for display on a typical personal computer display. As shown, the exemplary web page 120 may include border displays such as a top banner 122, a bottom banner 124, a side bar 126, and/or a navigation bar 128, and a main or central display 130. The top banner 122 is 10 typically an advertisement or a main table of contents while the bottom banner 124 typically includes various links to miscellaneous information such as privacy statement, copyright, disclaimer, contact information, and/or a site map for the website.

The side bar may include a main table of contents, if a main table of contents is not included as part of the top banner 122, and/or a more detailed table of contents for the particular 15 portion of the Web content currently being displayed in the central display 130 of the Web page 120. As is evident, any other combinations of border display, if any, may be implemented.

The main or central display 130 may include any combination of elements such as various submission buttons 132a, 132b, 132c, text box 134, pull down menu 135, table 138, simple text 140 such as headings and/or body text, layout tools such as a horizontal line 142, 20 numbered and/or unnumbered lists, graphics, and/or various other suitable components.

As is evident, there are various types or classes of web pages. In a simple case, the web page or content merely contains a single page of text that is read from top to bottom. In such a case, little, if any, reconfiguration is necessary in order for the small display device to display such a web page.

25 However, many web pages have more complex layouts, such as the one shown in FIG. 2. For example, a web page may have disjoint content that includes banners, a navigation bar, a

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table of contents, and/or various other links, in addition to the central portion of the display.

Such disjoint content may be implemented as tables, frames with static or relatively static borders, and/or forms. In the case of a table, the given table may be a single-cell table such that the table is simply a method for formatting rather than to gather and display information as may be the case for multi-cell tables. In the case of a form, the form may contain a number of fields.

5 A form is typically utilized by e-commerce websites in which the end user can fill out text boxes such as delivery and billing address, credit card numbers, and/or check or select various selections.

For such more complex web pages, reconfiguration is typically desirable in order for the  
10 small display device to display the more complex web pages in an efficient, coherent, and user-friendly manner. In particular, reconfiguration of a web page containing relatively complex content may include examining and classifying the various components of the web page, apportioning the various components and/or portions of the components into one or more sub-pages, and/or generating a table of contents for more succinct display on a small display device  
15 rather than attempting to display a large area in a small area display.

**FIG. 3** is a flow chart illustrating a communication process 150 between the client small display device and the reconfiguration application. At step 152, the reconfiguration application receives a request and/or data from the client small display device. The reconfiguration application reconfigures the request and/or data, if necessary, at step 154 and forwards the  
20 reconfigured request and/or data to the destination host server via the Internet, at step 156. For example, if the reconfiguration application resides with a proxy server, the reconfiguration application may reconfigure the URL and/or other information transmitted by the small display device and generate a packet with the proxy server rather than the small display device as the source.

25 At step 158, the reconfiguration application receives a response from the destination host server. The response is typically in a format or in accordance with a protocol such as HTML

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that is more suitable for the conventional large display. At step 160, the reconfiguration application analyzes, transforms, reconfigures, and/or otherwise manipulates the source/content document of the response for display on devices particularly those with small display areas.

Lastly, at step 162, the reconfigured page is transmitted to the device for display.

5       **FIG. 4** is a flow chart illustrating the process 160 executed by the manipulation or reconfiguration application for analyzing, transforming, reconfiguring, and/or otherwise manipulating Web content for display on devices with small display areas. At step 166, the reconfiguration application filters the source document for various components such as advertisements, banner across a top border, banner across a bottom border, table of contents, frames, forms, tables, simple text and/or any other suitable component of a webpage or content.

10      Next, at step 168, the reconfiguration application analyzes and reconfigures the content of all or portions of one or more components of the source content document. The reconfiguration step may comprise any number of reconfiguration processes. Each process may be dependent upon the particular component that is to be reconfigured, such as the type and/or display size of the component, for example. In particular, the reconfiguration application may 15 reorganize the various components such as by redistributing the various components into a logical sequence. The logical sequence facilitates in the top-down display of the source contents.

20      **FIGS. 5-7** are flow charts illustrating in more detail the reconfiguration process 168 for various types of components, including banner and/or advertisements, tables, and frames and/or forms. Each of these processes are merely exemplary and various other types of components of the source content may be similarly reconfigured using these examples as bases. Each of these processes will be described in more detail below with reference to the respective drawing.

25      **FIG. 5** is a flow chart illustrating in more detail the reconfiguration process 168a for objects such as a banner, advertisement, chart, or graphic. At step 180, the reconfiguration

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application determines the display size of the object and determines whether the object should be rescaled and/or resized. For example, the reconfiguration application may apply a threshold or any other suitable test to determine whether the banner, advertisement, chart, and/or graphic should be resized. For example, step 180 may involve the rescaling of charts and/or graphics.

- 5        If it is determined that the banner or advertisement does not need to be rescaled, then the banner or advertisement will be displayed without rescaling and process 168a is complete. Alternatively, if it is determined that the banner or advertisement should be rescaled, then the banner or advertisement is rescaled at step 182. For example, step 182 may involve scaling down separate graphics (such as lines and/or pictures) in relationship with each other and may 10 involve downsizing text and relocating the text to suitable locations.

In the case of a banner, the process 168a is complete after step 182. However, in the case of advertisements, the reconfiguration application determines if there are too many advertisements to be displayed as a single web page in a small display at step 184. For example, the reconfiguration application may determine the cumulative area for display of the 15 advertisements to determine whether there are too many advertisements. Alternatively, the reconfiguration application may apply a threshold test to determine whether there are too many advertisements. Any other suitable test may be applied to determine whether there are too many advertisements to be displayed as a single web page.

- If it is determined that there are not too many advertisements, then process 168a is 20 complete. Alternatively, if it is determined that there are too many advertisements, then the reconfiguration application generates a table of contents of the advertisements at step 186. In such a case, the table of contents of the advertisements, rather than the advertisements, is displayed by the display device.

**FIG. 6** is a flow chart illustrating in more detail the reconfiguration process 168b for 25 table-formatted content. At step 190, the reconfiguration application determines whether the table-formatted content is an actual table or merely non-table content that is formatted as a table

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for purposes of format and display. Typically, content that is formatted as a table for purposes of format and display contains only one table cell or, in some cases, in a single table row or in a single table column. In contrast, an actual table typically contains multiple table cells and/or multiple rows and/or columns. As is evident, any other suitable criteria may be implemented for  
5 the determination of whether table-formatted content is an actual table or merely content  
formatted as a table.

If it is determined that the table-formatted content is not an actual table in step 190, the reconfiguration application extracts information from the table-formatted content at step 192. The reconfiguration application may then complete process 168b by generating a table of  
10 contents for the extracted content at step 194. Preferably, a table of contents is generated even for table-formatted content that is not an actual table if the single-cell has sufficiently large content.

Alternatively, if it is determined that the table-formatted content is an actual table in step 190, then at step 196, the reconfiguration application extracts information from the table, such as  
15 the table, row and/or column headings as well as data in each row and column. For example, the reconfiguration application may utilize the HTML table heading <th> </th> tags to extract table headings from a table. As another example, the reconfiguration application may utilize various HTML tags that are positioned immediately before or above the table, such as header or sub-  
header tags, e.g., <h1> </h1> tags, and/or format tags such as bold, underline, italics, and/or any  
20 other suitable tags.

Any other suitable methods may be utilized to extract data from a table. For example, U.S. Pat. No. 5,737,442 issued on April 7, 1998 to H. Alam discloses a processor based method for recognizing, capturing and storing tabular data from digital computer data representing a document, the entirety of which is incorporated in its entirety by reference herein.

25 The reconfiguration application may then complete process 168b by rescaling data extracted from the table by apportioning the table columns and/or rows as necessary into

multiple tables while maintaining appropriate headings at step 198. Any suitable method to reconfigure a table or data from a table may be utilized. For example, U.S. Application No. 09/346,786, filed on July 7, 1999 and entitled "Conversion of Data Representing a Document to Other Formats for Manipulation and Display," the entirety of which is incorporated by reference herein, discloses various methods for reconfiguring a table or data from a table.

5           **FIG. 7** is a flow chart illustrating in more detail the reconfiguration process 168c for a frame or a form. In particular, at step 202, the reconfiguration application establishes or builds a logic sequence of the elements or data of the frame or form. At step 204, the reconfiguration application determines whether there is too much data to display on a small display device. If it 10 is determined that the there is not too much data to display on a small display device, then process 168c is complete. Alternatively, if it is determined that there is too much data to display on a small display device, then, at step 206, the reconfiguration application generates a table of contents according to the logical sequence that is established or built such as from the contents of the elements of the frame or form component.

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#### **Generation of Table of Contents**

As described above, the reconfiguration application or process may generate a table of contents from the content of the source document, such as by organizing the components into a logical sequence. The reconfiguration application implements a similar method with respect to 20 tables and frames to generate a table of contents. Various methods may be utilized in examining and determining the entries for the table of contents. For example, methods disclosed in U.S. Application No. 09/346,786, filed on July 7, 1999 and entitled "Conversion of Data Representing a Document to Other Formats for Manipulation and Display," (reference above) may be utilized herein.

25           In one embodiment, each segment of a frame or table may be reconfigured as an entry in the table of contents to be generated. With respect to a frame, the table of contents for the main

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content portion of the web page may be generated using any suitable method, such as a recursive method.

With respect to a main or central content portion of the web page, headings and/or subheadings may be utilized as entries in the table of contents to be generated. Headings and/or subheadings may be extracted from a web page in the HTML format such as with the various HTML tags that may signify a heading or a subheading. Examples of such tags include header, sub-header, italics, bold, underline, all caps tags and/or any other suitable tags.

Alternatively or additionally, a set of links that the source web page contains may be utilized as entries in the table of contents to be generated. In such a case, the reconfiguration application preferably removes the duplicate links from the table of contents. In particular, the reconfiguration application may extract each link from the source web page, convert the link to an absolute link if the link is not already an absolute link, examine whether the link is a duplicate of a previously extracted link, and discard the link if the link is a duplicate of a previously extracted link. As will be described in more detail below, if a given link is given as a relative URL link rather than an absolute URL link, the link is preferably converted to the corresponding absolute link. In HTML, links are tagged with "href" tag and thus may be easily extracted. In addition to displaying the generated table of contents, the reconfiguration application may additionally display navigation frame or entry across the top of the small display page.

Each entry in the generated table of contents corresponds to some target content. When the end user clicks or otherwise selects an entry in the generated table of contents, a more detailed table of contents may be generated from the target content or the target content is directly displayed. In other words, a single web page containing the source content may be display as one or more pages after the reconfiguration application reconfigures the content. In one example, the contents of the source web page may be represented by a single table of contents and when an end user selects or clicks on a table of contents entry, the reconfiguration

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application generates a portion of the source web page corresponding to the selected table of contents entry for display.

In generating the table of contents, if a particular table of contents entry points to static content, e.g., other segments, the reconfiguration application may cache the static content and access the cached static content when the table of contents entry is selected. However, if the table of contents entry points to dynamic content, such as weather or stock quotes in which the content changes over time, various methods for accessing such dynamic content may be implemented by the reconfiguration application. For example, the reconfiguration application may simply cache the target content when the table of contents is generated or reload the target content when the table of contents entry is selected. In the latter case, it is noted that the link or dynamic information may no longer exist when the end user selects the entry. In such a case, an error page noting the problem may be displayed.

#### Conversion of Relative URLs to Absolute URLs

In the reconfiguration process 168, the reconfiguration application may encounter various links to other URLs. Such links may be represented in the original HTML page as an absolute URL or a relative URL. In the case of relative URLs, it may be necessary or desirable for the reconfiguration application to convert some or all the relative URLs to absolute URLs. The reason for such conversion is that when the reconfiguration process or application reconfigures the web page, the original web page may be divided into more than one page for display such that the original web page URL may be different. Thus, the relative URL may lose meaning after the reconfiguration process and/or it may be more difficult to keep track of the original URL throughout the reconfiguration process. By converting all relative URLs encountered in the source document to absolute URLs, the end user may select or click on the link and be directed to contents at the desired URL. For example, the source for an HTML page residing at [www.any\\_company.com/list/a.html](http://www.any_company.com/list/a.html) may include a relative URL “/b.html” that is

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equivalent to the absolute URL www.any.com/b.html. As another example, the source for an HTML page residing at www.any.com/list/a.html may include a relative URL “c.html” that is equivalent to the absolute URL www.any.com/list/c.html.

5           **FIG. 8** is an illustrative display of a web page on a typical personal computer display. As shown, the web page 220 includes a central or main display portion 222 as well as a navigation bar 224 displaying a more detailed table of contents for the “About Us” portion of the web page, an overall table of contents 226 across the top border, a company logo or banner 228 including additional navigation buttons below the overall table of contents 226, and a pull-down menu  
10 230.

15           **FIG. 9** is an illustrative display of a selection page 236 displayed on a small display device. As shown, the end user of the small display device may enter the website that the end user desires to view or visit. In addition, the end user may also select a display option from options such as text summary, text full display, PDA summary, original format, re-flow for original format, or any other suitable display options.

20           **FIGS. 10-12** are illustrative displays of various components of the web page of **FIG. 8** reconfigured using the PDA summary display option for display on a exemplary PDA small display device. In the PDA summary display format, the overall table of contents 226’ is first displayed in a vertical format on the small sized display as shown in **FIG. 10**. Next, the pull-down menu 230’ and the central or main display portion 222’ are display as shown in **FIG. 11**. Following the central or main display portion 222’, the navigation bar 224’ is displayed as shown in **FIG. 12**. As is evident, the original source web page having a layout as shown in **FIG. 8** is reconfigured by the reconfiguration application for a top-down display on a small display device in a logical sequence: the overall table of contents 226’, the pull-down menu 230’, the central or main display portion 222’, and the navigation bar 224’. As is evident, any other  
25

suitable sequence may be generated by the reconfiguration application for display on the small display device.

FIG. 13 is an illustrative display of another web page 240 on a typical personal computer display. In addition, FIGS. 14 and 15 are illustrative displays of various components of the web page of FIG. 13 reconfigured using the text only display option for display on a exemplary PDA small display device. As shown in FIGS. 14 and 15, the original source web page having a layout as shown in FIG. 13 is reconfigured by the reconfiguration application for a top-down display in a logic sequence

As shown, a first screen 250 of the reconfigured small display shown in FIG. 14 displays the top border portion of the source web page 240, namely, the date, the banner, and the index/search. A second screen 252 of the reconfigured small display shown in FIG. 15 displays the categories on the left side of the source web page 240.

The reconfiguration application may be implemented as a service or may be bundled with various other services. For example, the provider of the reconfiguration application or service may include advertisements that is not necessarily contained in the source content with each reconfigured page or each reconfiguration session. The reconfigured page may include buttons, such as across the top, side, or bottom of the reconfigured display page and/or the initial display type selection page, for access to preferred content providers. The reconfiguration application may be provided as a service to content providers. In addition, dedicated servers may be utilized in order for faster access for certain preferred content providers and/or for customers of certain wireless service providers. In other words, when an end user is a subscriber of a preferred wireless service provider, the end user can access the services of the reconfiguration application via the dedicated servers in order to gain faster access to the desired information. In one variation, end users who are not subscribers of preferred wireless service providers are blocked and cannot utilize the services of the reconfiguration application.

FIGS. 16 and 17 illustrate a schematic and a block diagram, respectively, of an example of a general purpose computer system 1000 suitable for executing software programs that implement the methods and processes described herein. The architecture and configuration of the computer system 1000 shown and described herein are merely illustrative and other computer system architectures and configurations may also be utilized.

The illustrative computer system 1000 includes a display 1003, a screen 1005, a cabinet 1007, a keyboard 1009, and a mouse 1011. The mouse 1011 can have one or more buttons for interacting with a GUI (graphical user interface) that may be displayed on the screen 1005. The cabinet 1007 typically house one or more drives to read a computer readable storage medium 1015, system memory 1053, and a hard drive 10155, any combination of which can be utilized to store and/or retrieve software programs incorporating computer codes that implement the methods and processes described herein and/or data for use with the software programs, for example. Examples of computer or program code include machine code, as produced, for example, by a compiler, or files containing higher level code that may be executed using an interpreter.

Computer readable media may store program code for performing various computer-implemented operations and may be encompassed as computer storage products. Although a CD-ROM and a floppy disk 1015 are shown as exemplary computer readable storage media readable by a corresponding CD-ROM or floppy disk drive 1013, any other combination of computer readable storage media can be utilized. Computer readable medium typically refers to any data storage device that can store data readable by a computer system. Examples of computer readable storage media include tape, flash memory, system memory, and hard drive may alternatively or additionally be utilized. Computer readable storage media may be categorized as magnetic media such as hard disks, floppy disks, and magnetic tape; optical media such as CD-ROM disks; magneto-optical media such as floptical disks; and specially

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configured hardware devices such as application-specific integrated circuits (ASICs), programmable logic devices (PLDs), and ROM and RAM devices. Further, computer readable storage medium may also encompass data signals embodied in a carrier wave, such as the data signals embodied in a carrier wave carried in a network. Such a network may be an intranet 5 within a corporate or other environment, the Internet, or any network of a plurality of coupled computers such that the computer readable code may be stored and executed in a distributed fashion.

Computer system 1000 comprises various subsystems. The subsystems of the computer system 1000 may generally include a microprocessor 1051, system memory 1053, fixed storage 1055 (such as a hard drive), removable storage 1057 (such as a CD-ROM drive), display adapter 1059, sound card 1061, transducers 1063 (such as speakers and microphones), network interface 1065, and/or scanner interface 1067.

The microprocessor subsystem 1051 is also referred to as a CPU (central processing unit). The CPU 1051 can be implemented by a single-chip processor or by multiple processors. 15 The CPU 1051 is a general purpose digital processor which controls the operation of the computer system 1000. Using instructions retrieved from memory, the CPU 1051 controls the reception and manipulation of input data as well as the output and display of data on output devices.

The network interface 1065 allows CPU 1051 to be coupled to another computer, 20 computer network, or telecommunications network using a network connection. The CPU 1051 may receive and/or send information via the network interface 1065. Such information may include data objects, program instruction, output information destined to another network. An interface card or similar device and appropriate software implemented by CPU 1051 can be used 25 to connect the computer system 1000 to an external network and transfer data according to standard protocols. In other words, methods and processes described herein may be executed solely upon CPU 1051 and/or may be performed across a network such as the Internet, intranet

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networks, or LANs (local area networks), in conjunction with a remote CPU that shares a portion of the processing. Additional mass storage devices (not shown) may also be connected to CPU 1051 via the network interface 1065.

The subsystems described herein are merely illustrative of the subsystems of a typical computer system and any other suitable combination of subsystems may be implemented and utilized. For example, another computer system may also include a cache memory and/or additional processors 1051, such as in a multi-processor computer system.

The computer system 1000 also includes a system bus 1069. However, the specific buses shown are merely illustrative of any interconnection scheme serving to link the various subsystems. For example, a local bus can be utilized to connect the central processor to the system memory and display adapter.

The computer system 1000 may be illustrative of the computer system of the service provider, the proxy server, the client, and/or the end-user or customer.

While the preferred embodiments of the present invention are described and illustrated herein, it will be appreciated that they are merely illustrative and that modifications can be made to these embodiments without departing from the spirit and scope of the invention. Thus, the invention is intended to be defined only in terms of the following claims.

## CLAIMS

What is claimed is:

1. A reconfiguration system for reconfiguring a source content for display on a client display, comprising:

5 a filter adapted to examine the source content and filter the source content into one or more components; and

a reconfiguration application in communication with the filter and the client display, the reconfiguration application being adapted to analyze each of the one or more components of the source content and to reconfigure the source content comprising the one or 10 more components by one of generating a table of contents and reorganizing the components.

2. The reconfiguration system for reconfiguring source content for display on a client display device of claim 1, wherein the reconfiguration application reorganizes by redistributing the components of the source content.

15

3. The reconfiguration system for reconfiguring source content for display on a client display device of claim 1, wherein the reconfiguration application reorganizes dependent upon each component and at least one of size and corresponding type of each component.

20 4. The reconfiguration system for reconfiguring source content for display on a client display device of claim 1, further comprising:

a receiver adapted to receive input signals from the client device, the input signals identifying the source content; and

25 a transmitter adapted to selectively transmit signals to the client display device, wherein the reconfiguration application is in communication with the receiver and the transmitter.

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5. The reconfiguration system for reconfiguring source content for display on a client display device of claim 1, wherein the filter classifies each component as a type selected from the group consisting of advertisement, banner, table of contents, frame, form, table, and simple  
5 text.

10 6. The reconfiguration system for reconfiguring content for display on a display device of claim 5, wherein the reconfiguration application is adapted to reconfigure a banner component according to a display size of the banner.

15 7. The reconfiguration system for reconfiguring content for display on a display device of claim 5, wherein the reconfiguration application is adapted to reconfigure an advertisement component according to a display size of the advertisement component and a number of advertisements in the advertisement component.

20 8. The reconfiguration system for reconfiguring content for display on a display device of claim 5, wherein the reconfiguration application is adapted to reconfigure a table component by classifying the table as one of non-table text formatted as a table and table with table content.

25 9. The reconfiguration system for reconfiguring content for display on a display device of claim 8, wherein the reconfiguration application is adapted to reconfigure a non-table text formatted as a table component by extracting information from the table and selectively generating a table of contents therefrom.

25

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10. The reconfiguration system for reconfiguring content for display on a display device of claim 8, wherein the reconfiguration application is adapted to reconfigure a table with table content component by selectively rescaling at least one of rows with row headings and columns with column headings.

5

11. The reconfiguration system for reconfiguring content for display on a display device of claim 5, wherein the reconfiguration application is adapted to reconfigure one of a frame component and a form component according to an established logical sequence of elements of the component and selectively generating a table of contents from the elements of  
10 the component.

12. A method for reconfiguring a source content for display on a client display, comprising:

receiving a source content from a source;

15 reconfiguring the source content to a reconfigured content for display, the

reconfiguring including filtering the source content into one or more components, analyzing each component of the source content, and one of generating a table of contents and reorganizing the components; and

transmitting the reconfigured content to the client display for display on the client

20 display.

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13. A method for reconfiguring content for display on a client display according to  
claim 12, further comprising:

receiving a client request for a source content from a client display device, the  
request identifying the source for the source content;  
5 generating a source content request to the source for the source content; and  
transmitting the source content request to the source.

14. A method for reconfiguring content for display on a client display according to  
claim 12, wherein the reorganizing includes redistributing the components of the source content.

10

15. A method for reconfiguring content for display on a client display according to  
claim 12, wherein the reorganizing is dependent upon each component and at least one of size  
and corresponding type of each component.

15

16. A method for reconfiguring content for display on a client display according to  
claim 12, the reconfiguring includes classifying each component as a type selected from the  
group consisting of advertisement, banner, table of contents, frame, form, table, and simple text.

20

17. A method for reconfiguring content for display on a client display according to  
claim 16, wherein the reconfiguring reconfigures a banner component according to a display size  
of the banner.

25

18. A method for reconfiguring content for display on a client display according to  
claim 16, wherein the reconfiguring reconfigures an advertisement component according to a  
display size of the advertisement component and a number of advertisements in the  
advertisement component.

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19. A method for reconfiguring content for display on a client display according to  
claim 16, wherein the reconfiguring reconfigures a table component by classifying the table as  
one of non-table text formatted as a table and table with table content.

5 20. A method for reconfiguring content for display on a client display according to  
claim 19, wherein the reconfiguring reconfigures a non-table text formatted as a table  
component by extracting information from the table and selectively generating a table of  
contents therefrom.

10 21. A method for reconfiguring content for display on a client display according to  
claim 19, wherein the reconfiguring reconfigures a table with table content component by  
selectively rescaling at least one of rows with row headings and columns with column headings.

15 22. A method for reconfiguring content for display on a client display according to  
claim 16, wherein the reconfiguring reconfigures one of a frame component and a form  
component by establishing a logical sequence of elements of the component and selectively  
generating a table of contents from the elements of the component.

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23. A computer program product that reconfigures a source content for display on a client display, comprising

computer code that receives a source content from a source;

computer code that reconfigures the source content to a reconfigured content for  
5 display, the computer code that reconfigures includes computer code that filters the source content into one or more components, computer code that analyzes each components of the source content, and computer code that selectively performs one of generating a table of contents and reorganizing the components;

computer code that transmits the reconfigured content to the client display for

10 display on the client display; and

a computer readable medium that stores the computer codes.

24. A computer program product that reconfigures a source content for display on a client display according to claim 23, further comprising:

15 computer code that receives a client request for a source content from a client display device, the request identifying the source for the source content;

computer code that generates a source content request to the source for the source content; and

computer code that transmits the source content request to the source.

20

25. A computer program product that reconfigures a source content for display on a client display according to claim 23, wherein the computer code that reorganizes includes computer code that redistributes the components of the source content.

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26. A computer program product that reconfigures a source content for display on a client display according to claim 23, wherein the computer code that reorganizes performs the reorganizing dependent upon each component and at least one of size and corresponding type of each component.

5

27. A computer program product that reconfigures a source content for display on a client display according to claim 23, the computer code that reconfigures includes computer code that classifies each component as a type selected from the group consisting of advertisement, banner, table of contents, frame, form, table, and simple text.

10

28. A computer program product that reconfigures a source content for display on a client display according to claim 27, wherein the computer code that reconfigures performs reconfiguring on a banner component according to a display size of the banner.

15

29. A computer program product that reconfigures a source content for display on a client display according to claim 27, wherein the computer code that reconfigures performs reconfiguring on an advertisement component according to a display size of the advertisement component and a number of advertisements in the advertisement component.

20

30. A computer program product that reconfigures a source content for display on a client display according to claim 27, wherein the computer code that reconfigures performs reconfiguring on a table component by classifying the table as one of non-table text formatted as a table and table with table content.

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31. A computer program product that reconfigures a source content for display on a client display according to claim 30, wherein the computer code that reconfigures performs reconfiguring on a non-table text formatted as a table component by extracting information from the table and selectively generating a table of contents therefrom.

5

32. A computer program product that reconfigures a source content for display on a client display according to claim 30, wherein the computer code that reconfigures performs reconfiguring on a table with table content component by selectively rescaling at least one of rows with row headings and columns with column headings.

10

33. A computer program product that reconfigures a source content for display on a client display according to claim 27, wherein the computer code that reconfigures performs reconfiguring on one of a frame component and a form component by establishing a logical sequence of elements of the component and selectively generating a table of contents from the elements of the component.

15

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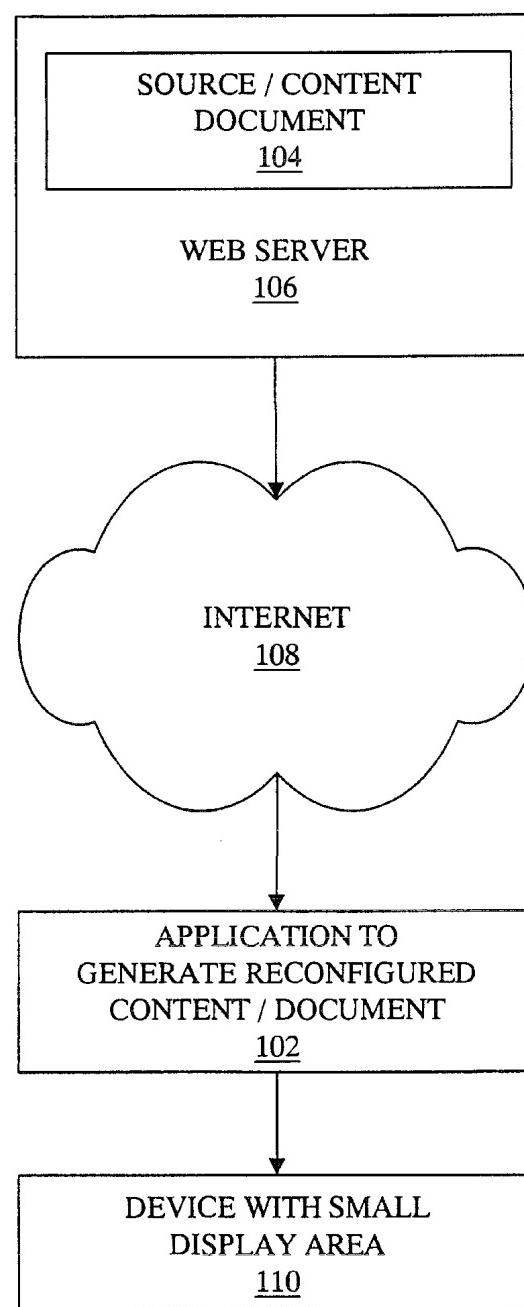
100  
↖

FIG. 1

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120

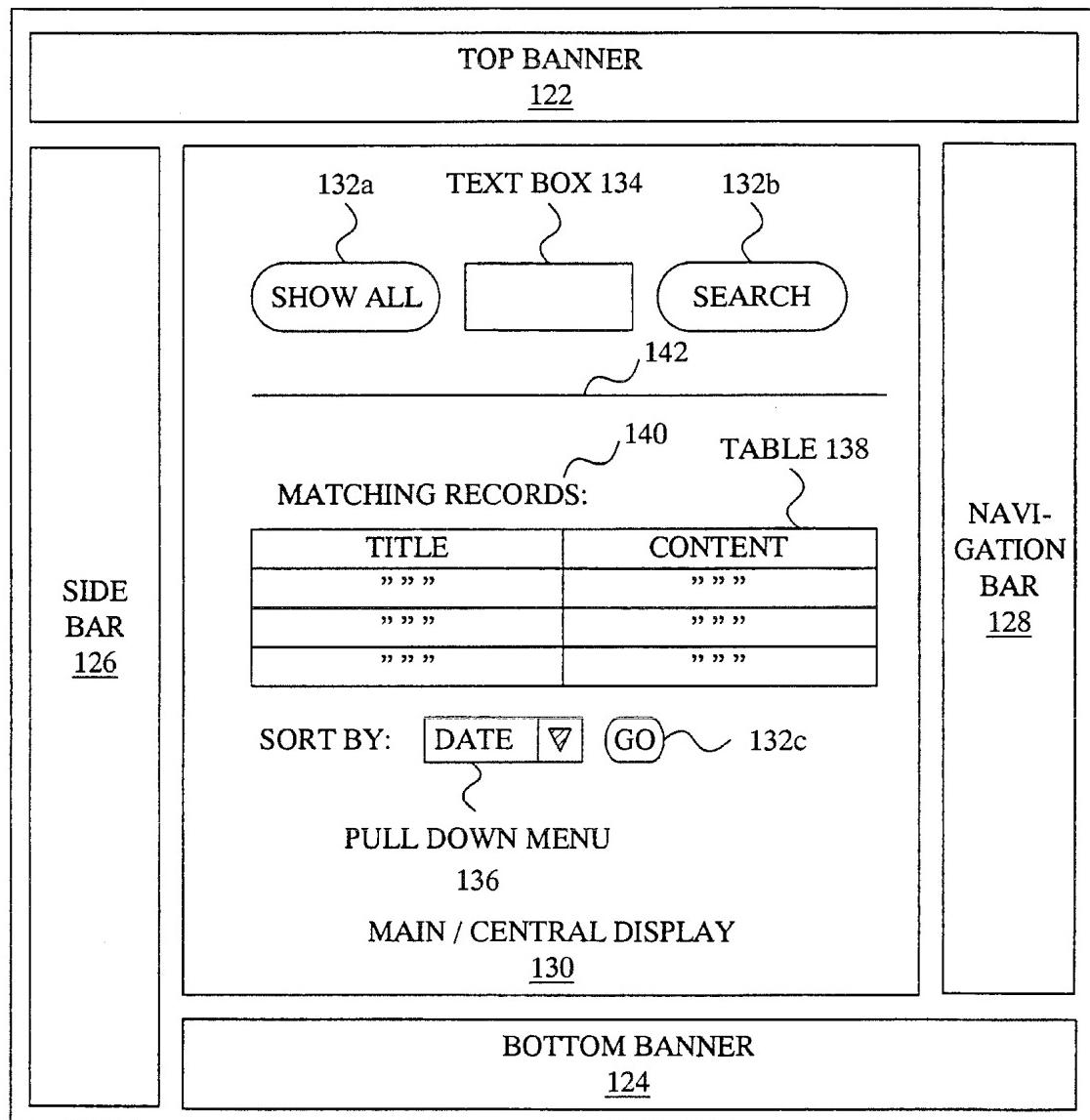


FIG. 2

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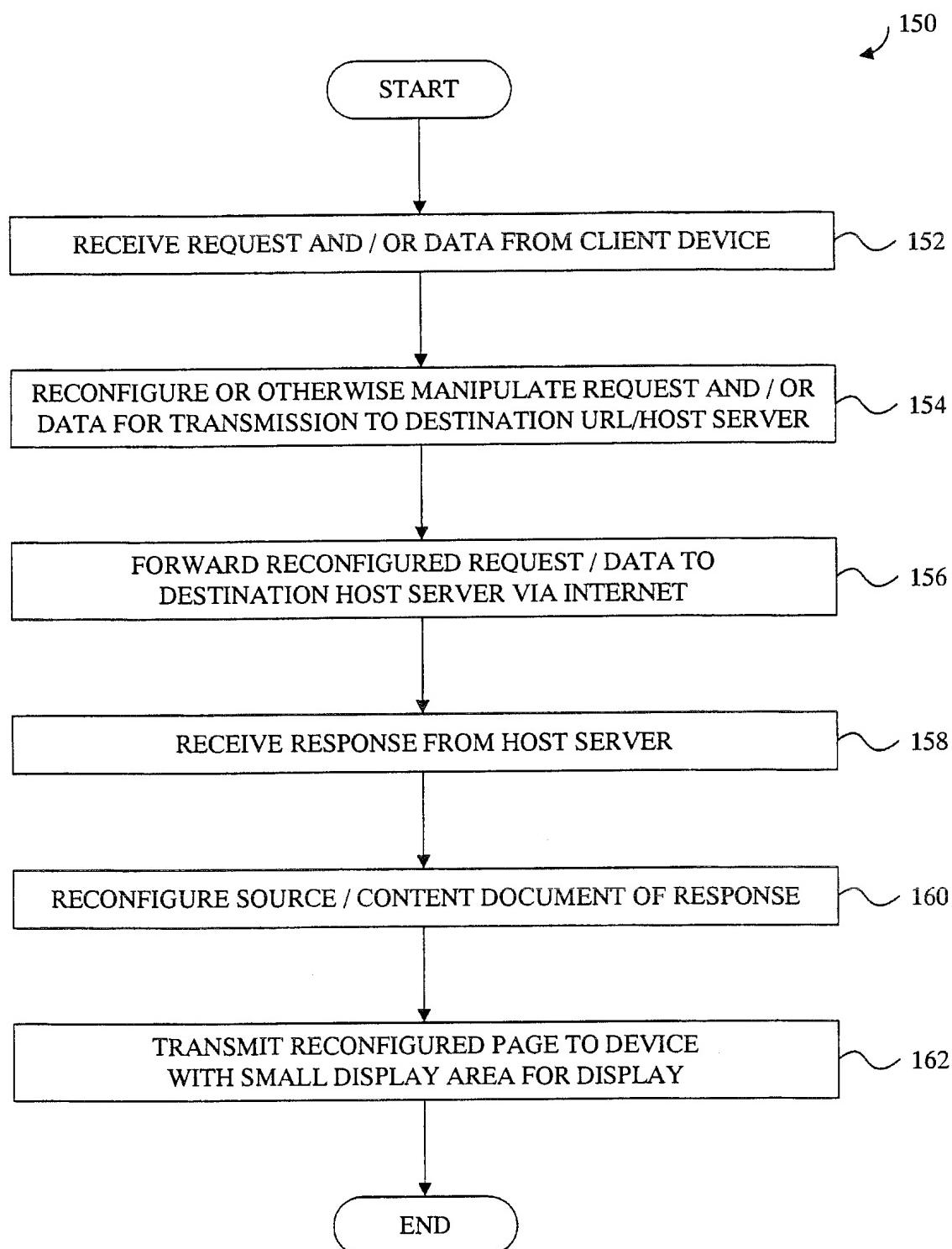


FIG. 3

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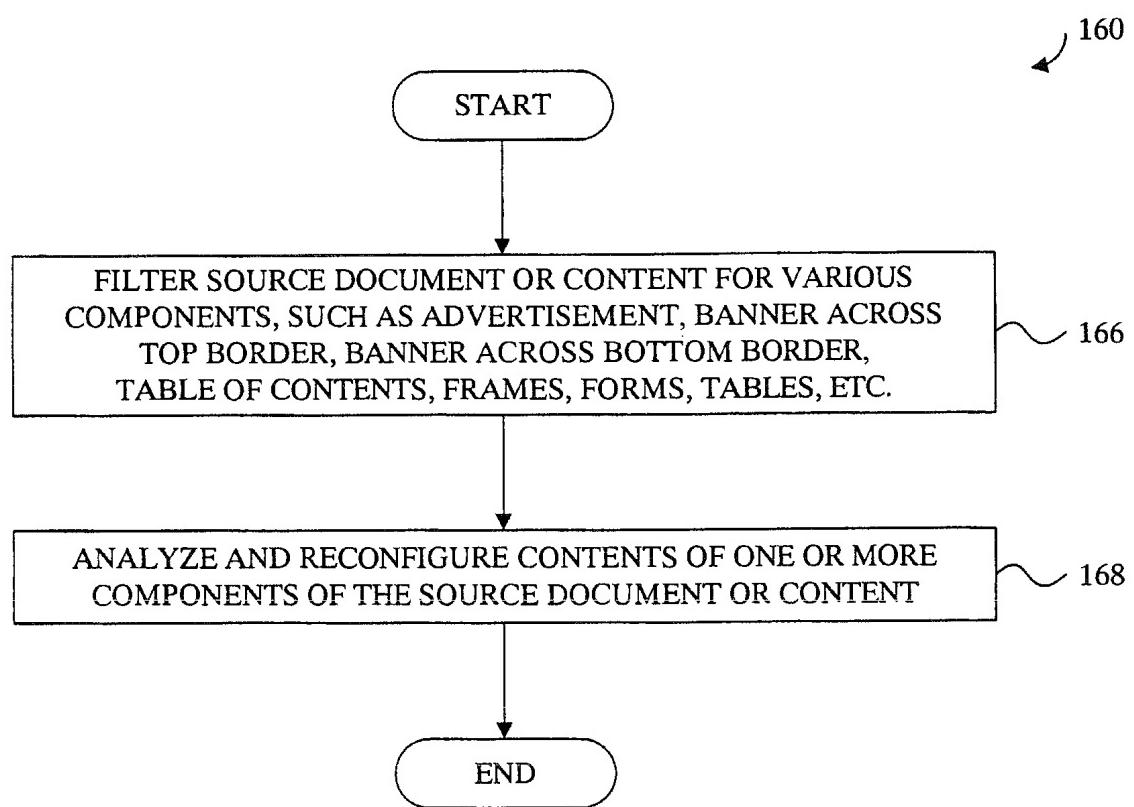


FIG. 4

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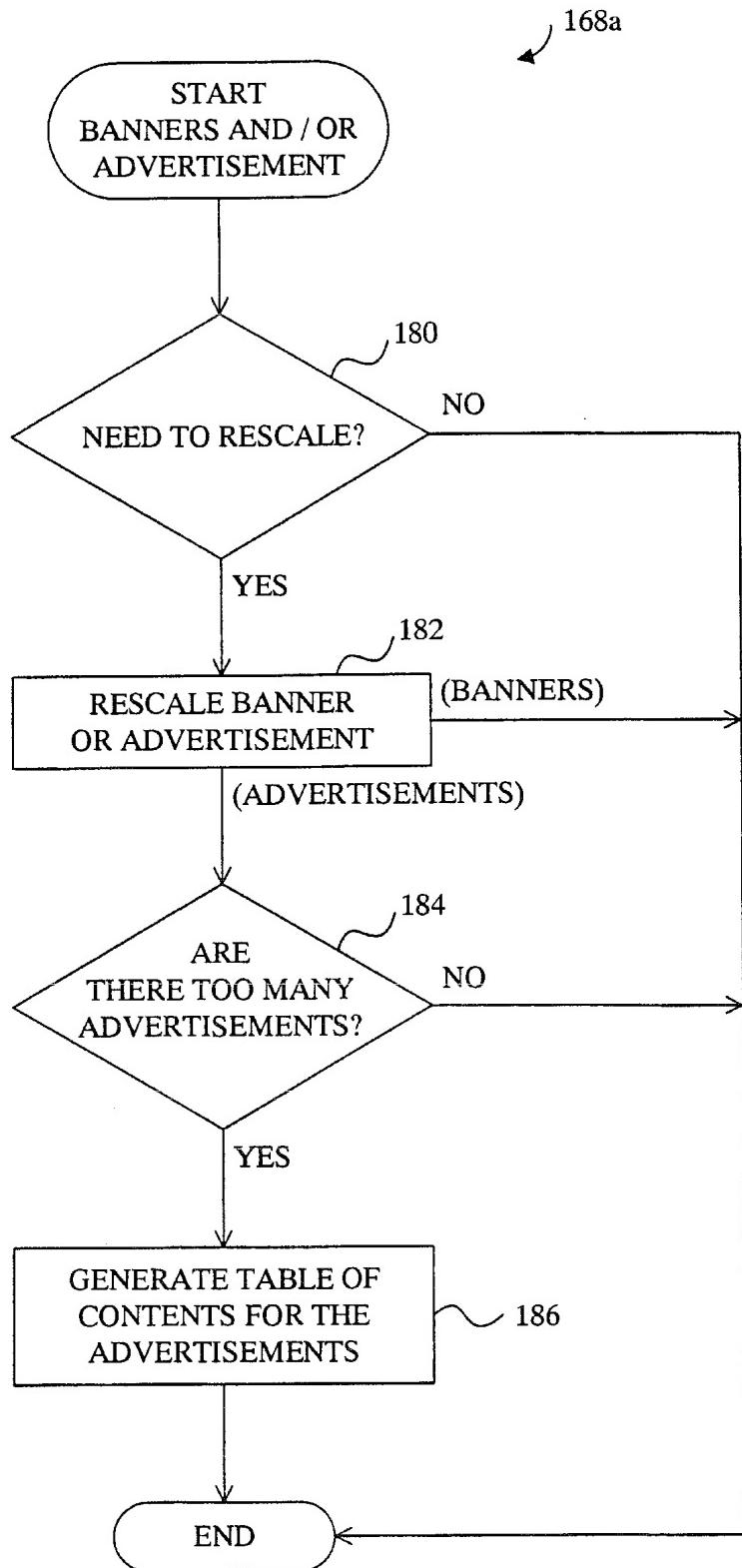


FIG. 5

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168b

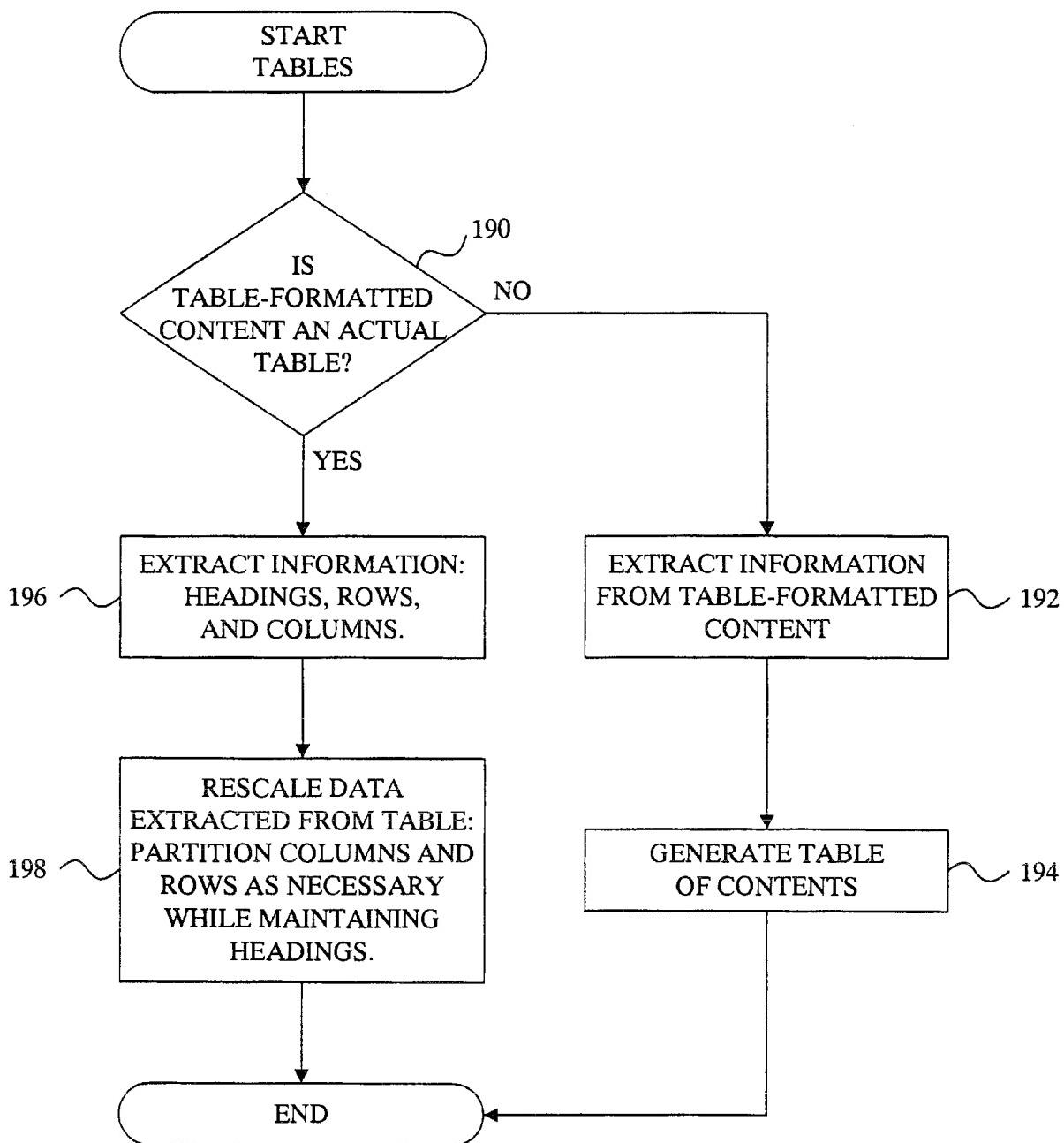


FIG. 6

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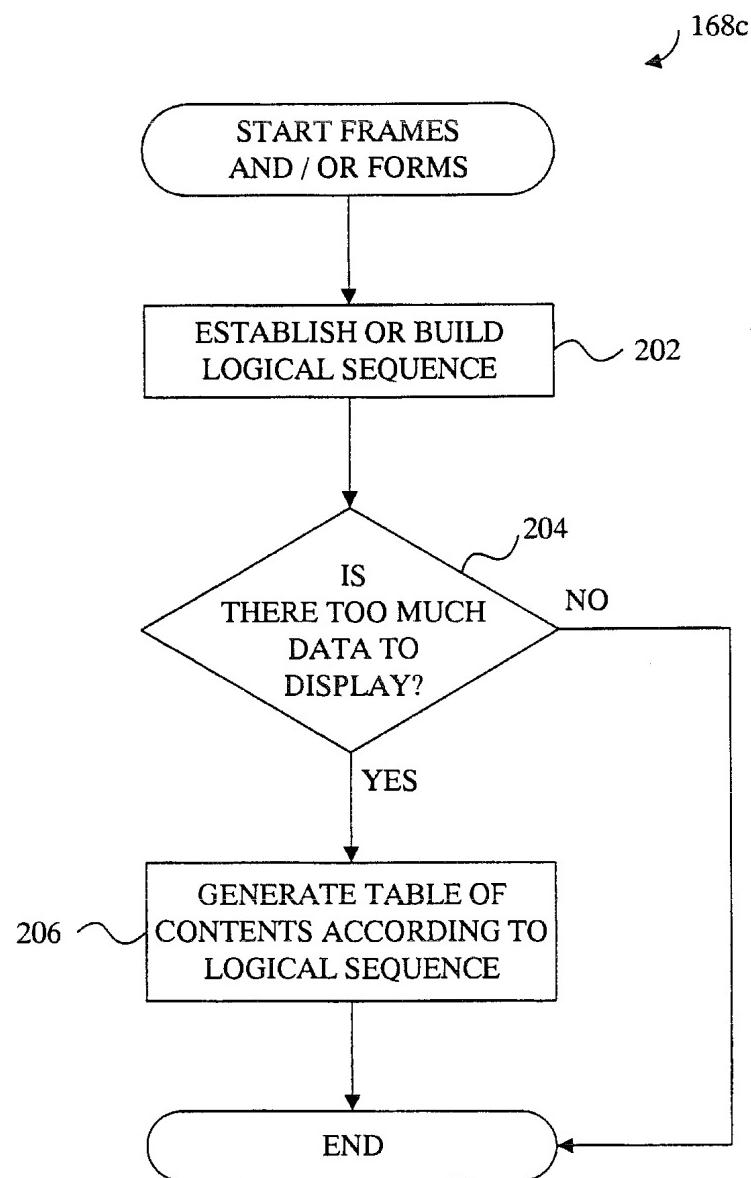


FIG. 7

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|   |          |                              |                        |
|---|----------|------------------------------|------------------------|
| www.bcl-computers.com   | About Us | Products                     | Support                |
|   |          | <a href="#">online store</a> | <a href="#">search</a> |
| <b>BCL</b><br>COMPUTERS   |          | <a href="#">sitemap</a>      |                        |
| <h2>About Us</h2>   |          |                              |                        |
| What do you want to do? <input type="button" value="- Select a task -"/>  |          |                              |                        |
| 228   |          |                              |                        |
| 222   |          |                              |                        |
| 230   |          |                              |                        |
| 224   |          |                              |                        |
| <ul style="list-style-type: none"> <li>▶ <a href="#">Literature</a></li> <li>▶ <a href="#">Press Release</a></li> <li>▶ <a href="#">Jobs @ BCL</a></li> <li>▶ <a href="#">Clients</a></li> <li>▶ <a href="#">Partnership</a></li> <li>▶ <a href="#">Contact Us</a></li> </ul> |          |                              |                        |

**We simplify**

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FIG. 8

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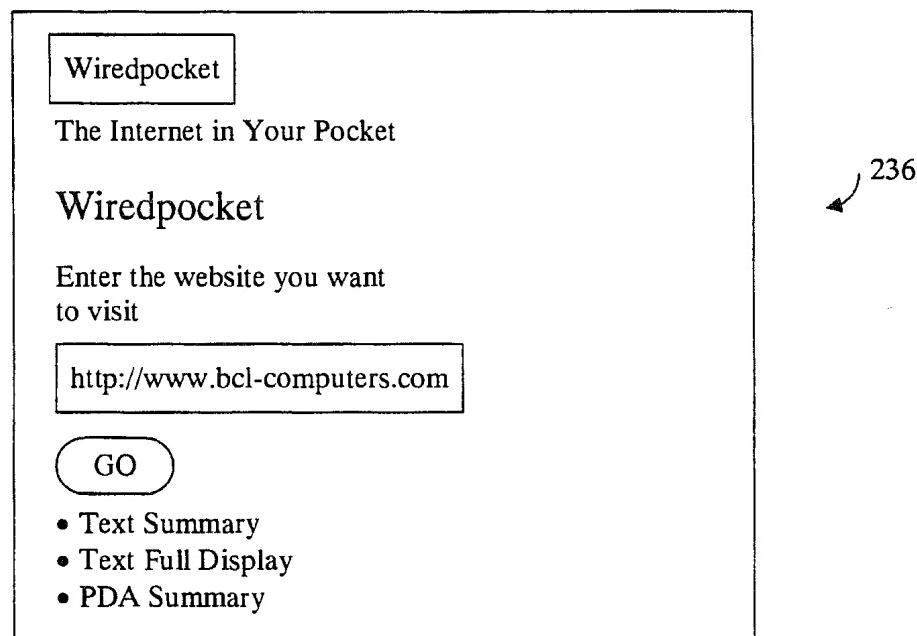


FIG. 9

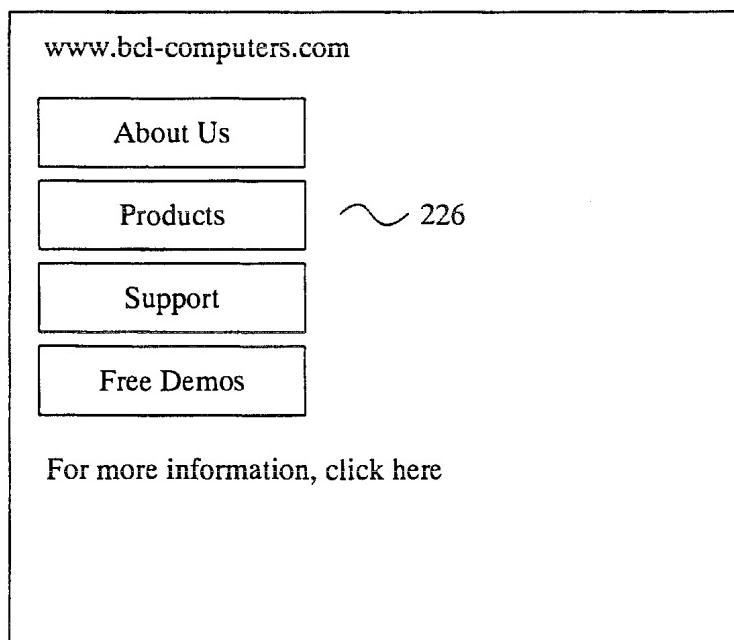


FIG. 10

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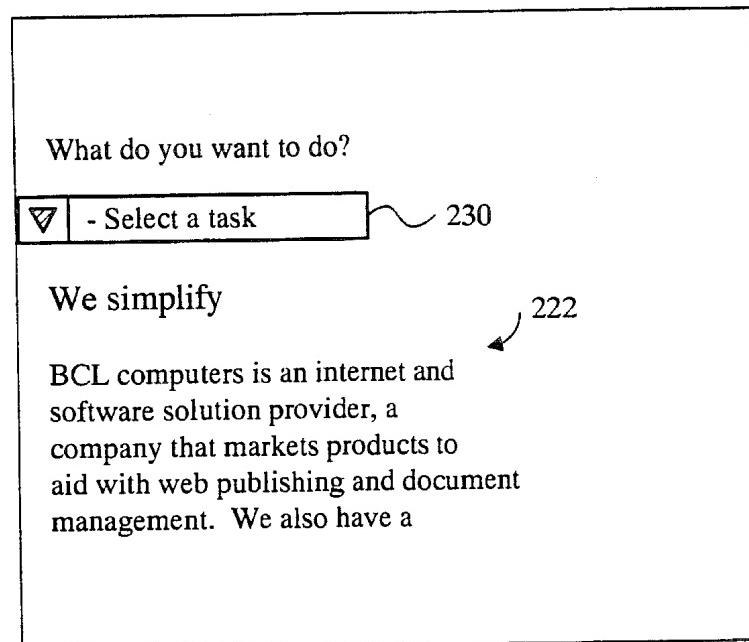


FIG. 11

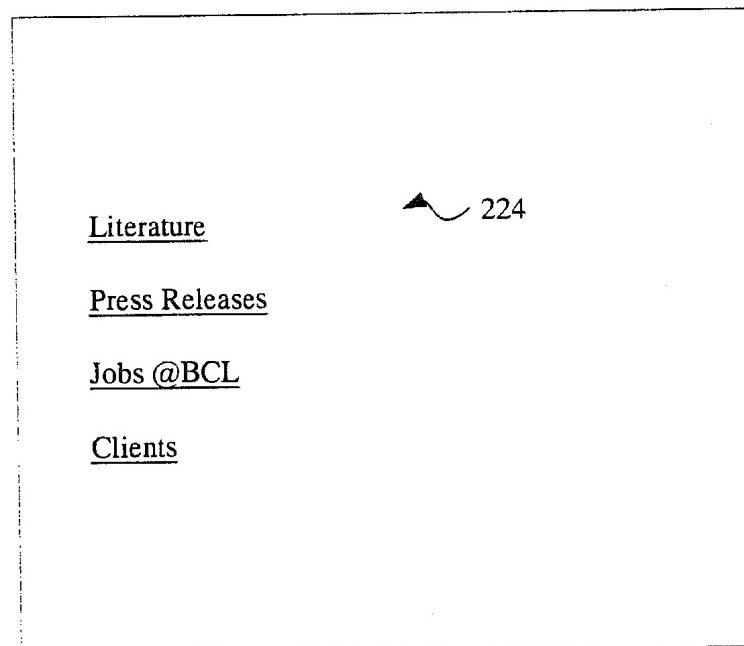


FIG. 12

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**BBC ONLINE HOMEPAGE**

Welcome to the UK's favourite website

Text only

**WEDNESDAY**  
31st May 2000

Visit these sites...

**CATEGORIES**

- News
- Weather
- Football
- Audio/Video
- Education
- Entertainment
- Food
- Health
- History
- Home & Garden
- Kids
- Nature
- Radio
- Science
- Teens
- World Service

**UK HOMEPAGE**

- England
- N Ireland
- Scotland
- Wales

**AT THE BBC**

- BBC Talent
- BBC Info
- BBC Jobs
- BBC Shop

**E-MAIL THIS PAGE**

**FEEDBACK**

**So do Something**  
In agony over sex or drugs? Call an aunt. If you like your sports **extreme**, sample this and then check out the talking knee-caps.

**CATEGORY: TEENS**

Go to the Teens homepage

**The language of revision**  
Frolic in **French** for Standard Grade or GCSE and groove in GCSE **German**. Stuck? Ask a teacher.

**CATEGORY: EDUCATION**

**Go Wild 2000**  
Plot your ladybirds on the interactive map, get some **froggy facts** and send us a sparrow picture for the gallery.

**CATEGORY: NATURE**

**TV & Radio websites** ▽ Go ←

**GET MORE FROM THE WEB**

**WebWise**  
Master the Internet with tips and advice.

**WebGuide**  
The best sites on the Worldwide Web.

**BBC Alert!**  
Get emailed what's on

**Live Chat: Food**  
Bare your soul to

**A-Z Index**

**Search BBC**

**Go**  
type your keywords above

**NEWS**

Latest bulletins

Ethiopia spurns UN appeal  
Double jobs boost for Belfast  
Man Utd net new Schmeichel

**SPORT**

Hasselbaink poised for Chelsea  
Easy for Agassi

**WEATHER FORECAST**

London Evening 14 °C

select city ▽

Go ←

**WORLD SERVICE**

→ Listen to live radio

**WHAT'S ON**

BBC TV & Radio listings  
→ R1 R2 R3 R4 R5

**beeb.com**

Your online shopping guide

FIG. 13

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250

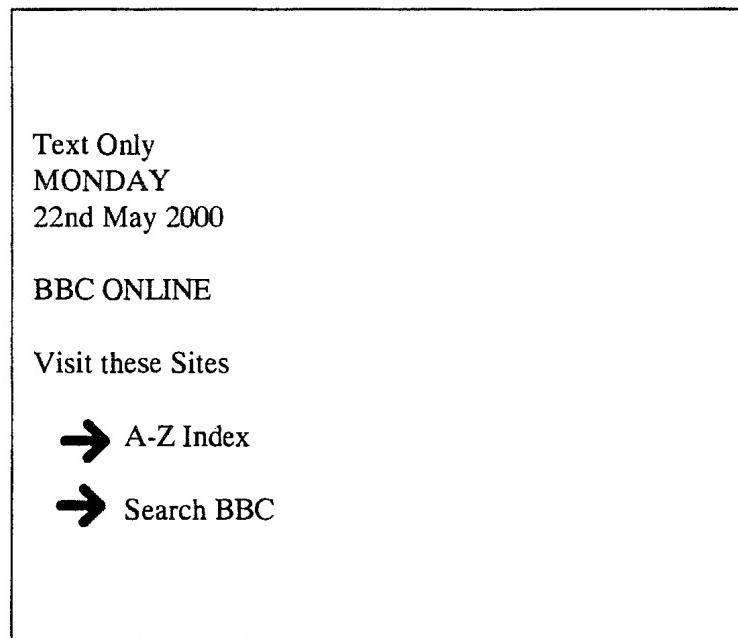


FIG. 14

252

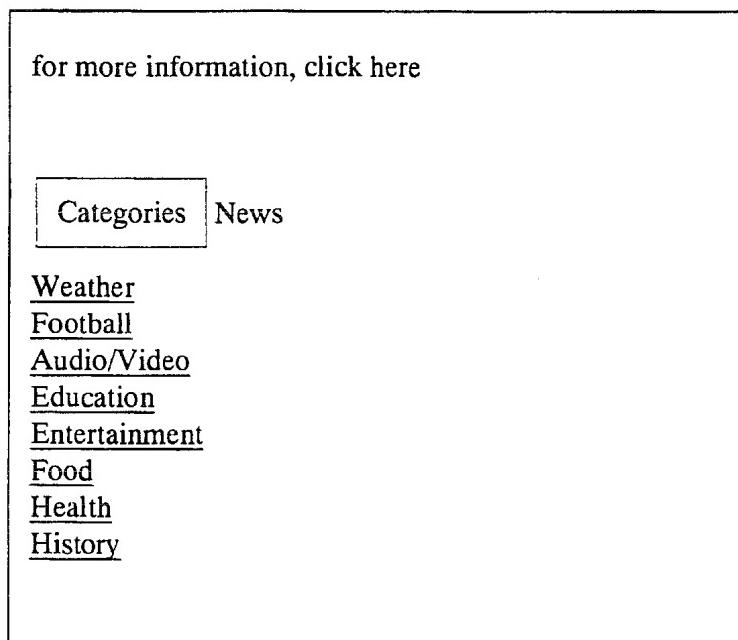


FIG. 15

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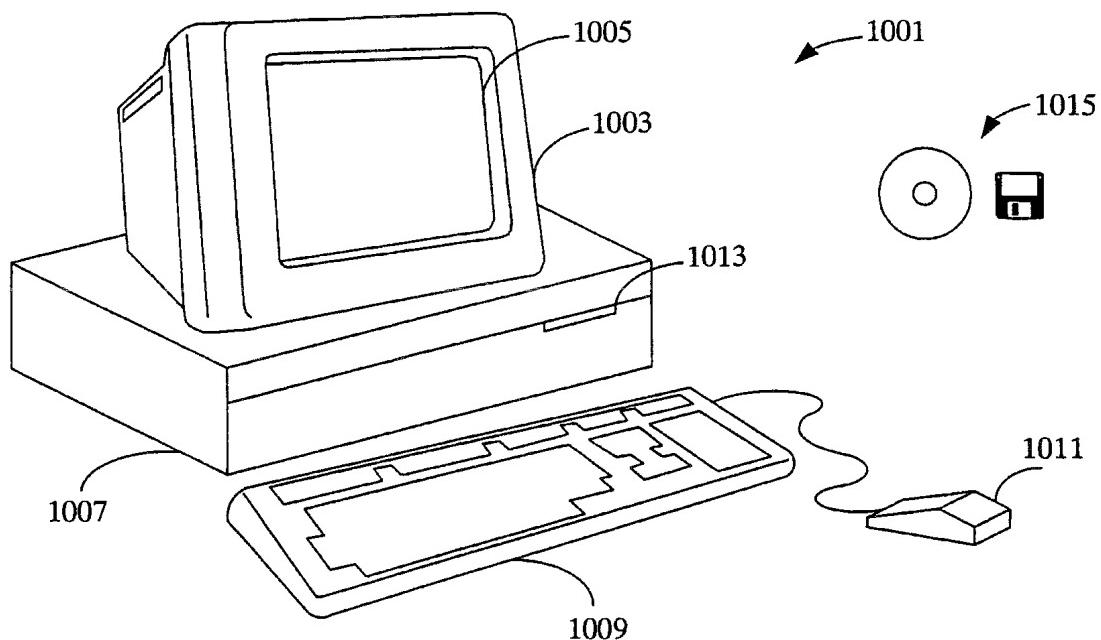


FIG. 16

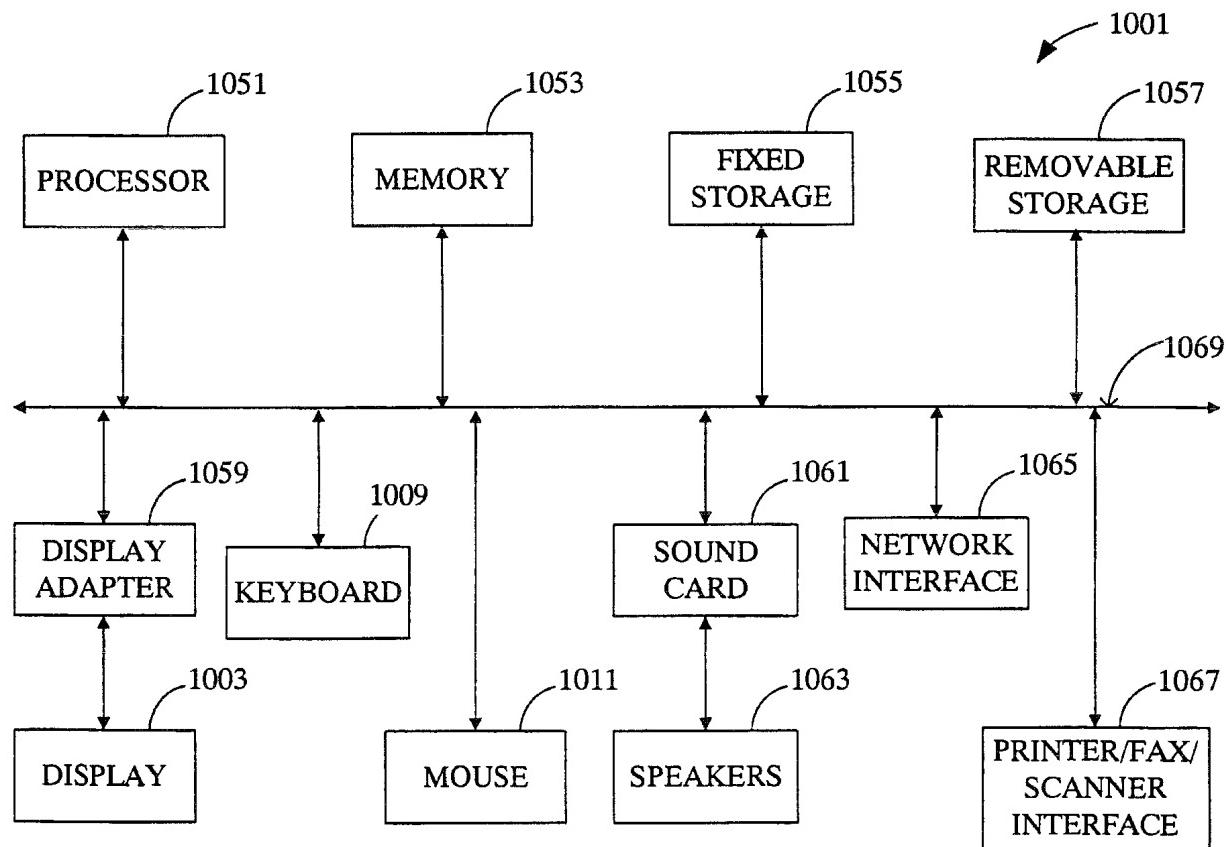


FIG. 17